What relation was there between bronchitis and climate? The weather may have encouraged it, but while there was a good deal of cloudiness and perhaps unusually cold weather in the fall and winter of 1917, yet there was no unusual humidity or precipitation—only the snowfall was greater.

I think we must admit, however, that climate, so far as seasons go, does play a great part in the incidence of acute respiratory diseases, especially pneumonia. We must look further than climate, however, for the explanation of these diseases during the winter of 1917. I have always believed that no climate can rise above the conditions of housing. The quartering of troops in unaccustomed climates will not explain it, but the housing of a large number of men together in one room with the change from overheated homes to the more or less cold barracks system of many of our camps, will account for much of it, but this condition was not confined to our Army camps. Acute respiratory conditions were on the rampage during the winter of 1917 among the civilian population, and I believe the foundation for the pandemic of the autumn of 1918 was then laid.

The following statement may surprise you all, but I believe that the fuel administration had the most to do with the causes which led up to the titanic struggle between bacterial and human life. Not that they were to blame. It was a military necessity. And, my friends, it is impossible for us to play at this war game without paying for it in both the front line and the extreme rear line or the homes that were necessarily mobilized for war purposes.

During the winter of 1917, on account of fuel shortage many people were obliged to close a large part of their houses and to live in a few rooms. This was especially true of the poor. Apartment houses were crowded and poorly heated. The people who could afford it flocked to hotels, many of which were under heated and overcrowded. People crowded together as never before witnessed in the civil population of all countries. Windows and doors had to be kept closed to keep the cold out, which resulted in a concentration of bacteria laden, indoor air, due to coughing and sneezing. The acute respiratory conditions in 1917, I feel, had some very definite relation to those in 1918. As the warm weather approached in the summer of 1918, these conditions subsided because windows were opened and people had reopened their closed rooms; the concentration of germ laden air had become diluted and it almost appears that a certain concentration is necessary for the spread of some of these diseases.

I have failed thus far to show any meteorological factor that influenced the pandemic with the exception of change in seasons. Does climate have any effect on the bacterial flora in any sense as it does on our terrestrial flora? This is a question that will bear some investigation.

* * * I feel that climate will have little to do with the next outbreak but it will come, perhaps not in my time and perhaps not for a longer period of time, but you climatologists who are present when a new susceptible population is established need not study meteorological influences or protections against it except so far as it concerns seasons. I do earnestly urge you to study housing, ventilation and sanitation and to be ever on the watch for business depressions, social problems such as widespread strikes, and new wars, which for economic reasons will cause people to live under restricted and crowded conditions.

THE CONTROL OF PNEUMONIA AND INFLUENZA BY THE WEATHER.

By ELLSWORTH HUNTINGTON, Research Associate in Geography, Yale University.

[Review and discussion by J. B. Kincer, Meteorologist, U. S. Weather Bureau.]

In the January, 1920, issue of *Ecology*, the official publication of the Ecological Society of America, Prof. Ellsworth Huntington gives in considerable detail the results of an investigation made by him as to the relation of temperature and relative humidity to the number of deaths from pneumonia in New York City for the period from April, 1917 to March, 1918.

He points out that in former investigations of this character the monthly figures of deaths have been compared with the weather conditions of the particular month, and these have indicated that deaths from pneumonia have a direct relation to outside temperature and decrease systematically as the temperature rises.

In order to test the matter in another way, Prof. Huntington has taken the day instead of the month as a unit and has tabulated the deaths from lobar and broncho-pneumonia in conjunction with the outside temperature for the particular day on which death occurred. For this purpose he has made 8 divisions of temperature for the period, namely, 20° or less, 21°–32°, 33°–45°, 46°–55°, 56°–65°, 66°–70°, 71°–75°, and over 75° F.

TABLE 1.—*Average daily deaths from pneumonia at various mean temperatures in New York City, from April, 1917, to March, 1918.*

Mean temperature, °F.	20° or less.	21°–32°	33°–45°	46°–55°	56°–65°	66°–70°	71°–75°	Over 75°.
Lobar-pneumonia...	26.5	26.4	27.8	20.6	17.4	9.4	6.3	6.7
Broncho-pneumonia.	8.3	9.6	8.2	6.2	5.4	3.9	2.5	3.3
Number of days.....	30	47	72	70	51	31	38	26

Table 1 shows the number of deaths reported under each of these groups of temperature. This table indicates a decline in the death rate with rising temperature. His comment on the table is as follows: "At the lowest temperatures there is a little irregularity, due to the fact that a mild epidemic doubled the death rate for a couple of weeks at the end of March. In view of the lateness of the season at which this occurred, it is surprising that the death rate at temperatures of 33° to 45° has not been raised much higher. In ordinary years the relation between low temperature and the death rate would be even stronger than appears in Table 1. At the right-hand end of the table a slight increase in deaths is apparent at high temperatures, above 75°. Judging by more abundant statistics for other diseases, this is a constant characteristic, and means that high temperatures as well as low are bad for pneumonia."

As a test of Shaw's [1] conclusion that influenza as well as pneumonia varies inversely with the temperature, Prof. Huntington has used the weekly figures for deaths from influenza in New York City during the 30 years from 1889 to 1918 and presents these data by means of a graph. He points out that deaths begin toward the end of September or at about the time when the nights first become frosty; the death rate suddenly increases about the middle of December, at approximately the time when the mean temperature falls below freezing, and reaches a maximum a little after the middle of January, or the time of minimum temperature.

[1] Napier Shaw, *Quar. Jour. Roy. Met. Soc.*, Vol. XLV, July, 1919.

RELATION OF HUMIDITY TO PNEUMONIA AND INFLUENZA.

Prof. Huntington takes up also the question of the relation of relative humidity to deaths from pneumonia and influenza during the period for which data are given for temperature. He uses the same method in this case as in the other, that is, by comparing the number of deaths on a given day with the outdoor humidity conditions on that particular day, and the result is given in tabular form (table not reproduced here). The days have been divided into 8 groups, according to temperature, as in the other case, and each group has been subdivided into 2 divisions: (1) Days with low relative humidity, (2) days with high relative humidity. In each of the 8 temperature groups the days with high relative humidity have an advantage over the drier days, ranging from 0.8 per cent up to 26.8 per cent. He discusses in considerable detail the significance of the statistics presented and comments thereon as follows:

During the winter the air in the average house in New York has a relative humidity of only about 30 per cent, while the deaths from lobar pneumonia number about 27 or 28 per day for the year under discussion. Suppose, now, that during the warm weather, when the outside air averages 55° to 70°, the humidity were to be as low as in our winter houses, apparently the pneumonia death rate would increase by at least a third, and perhaps one-half, over what it is in such weather when the humidity is 70 per cent or more. Of course a far larger body of figures is needed before we can determine the exact effect of any given condition, but the principle seems clear. Apparently we are killing people by the thousand simply because we do not properly humidify the air in our hospitals.[2]

TABLE 2.—*Effect of variability of the weather upon deaths from lobar and broncho pneumonia in New York City from April, 1917, to March, 1918.*

	April–September.			October–March.		
	Number of days.	Change in deaths from pneumonia.		Number of days.	Change in deaths from pneumonia.	
		Lobar.	Broncho.		Lobar.	Broncho.
Rise of 6° or more	15	−1.60	−1.00	43	−0.40	0.26
Rise of 2-5°	54	0.61	−0.21	44	1.07	0.64
Change of 1° or less	50	0.04	0.34	25	1.32	0.80
Drop of 2-5°	43	0.28	0.26	28	1.07	−0.89
Drop of 6° or more	20	−1.55	−1.30	42	−1.64	−1.21

NOTE.—The figures in the body of the table indicate the average amount by which the number of deaths increased or decreased *on the days* having the indicated changes in mean temperature. The change in mean temperature is the amount by which the average temperature for a given 24 hours is above or below that of the preceding 24 hours.

Prof. Huntington discusses also the relation of variability of temperature to deaths from pneumonia, by making comparisons on the same basis as in the other two cases. He presents Table 2 showing the relation of temperature rises of certain magnitudes and falls of similar amounts to the number of deaths from pneumonia for the same period as in the other cases. He bases the following comments on this table:

During variable weather, even when patients are in well-warmed houses, a drop in temperature stimulates by causing a decrease of the unfavorably high temperature which regularly prevails in our houses. It also causes much more movement of the air than at times when the weather stays stationary from day to day. The harm that comes from a rise in temperature at any season, except summer, is not easy to explain. Apparently it arises largely from the fact that when the outside air grows warm the inside is apt to run up to high levels, even 75° or more, a condition which is decidedly harmful. If this is the case, however, the benefit that apparently comes to pneumonia patients from a rise in temperature is puzzling. Possibly during the year used in this article the increased humidity, which usually prevails when the temperature rises, overcame the bad effect of increased warmth.

The epidemic of influenza in 1918 is finally discussed and some apparent relation to weather conditions is shown, but at the same time it is pointed out that nothing seems better established than that epidemics of this character may break out at any season and that, once started, they run their course in spite of weather or climate. The only question therefore in this connection is how far the conditions of the air may increase or decrease their severity.

DISCUSSION.

There is perhaps no subject which appeals to mankind more insistently than that of health, life, and death. Gladly one sacrifices the material accumulation of years of toil to forestall, or even postpone for a short season, the call of the "Grim reaper." In view of this, there is naturally a keen interest in any investigation of the character above outlined, especially so in a country such as ours, where opportunity affords for one to select for his place of abode almost any desired character of climate. The numerous inquiries received by the Weather Bureau, desiring information as to climatic conditions in different sections of the country, from people in every walk of life, seeking the return of lost health and prolonged life, attest the general interest in the subject and the universal belief that certain atmospheric conditions, even if not so efficacious as the fabled "Fountain of Youth," are potent to restore health and vigor.

At one place may be found a uniformly mild and humid climate, such as prevails at San Francisco, for example, and at another weather characterized by wide temperature variations, with rigorous winters, as in the north-central sections of the country, or even a semidesert environment, as in our great Southwest. As a matter of contrast in the way of temperature it may be pointed out that in San Francisco the average January temperature is 50° and the average July temperature only 57°, while in some north-central States the means are about zero and nearly 70°, respectively; in some southwestern sections of the country the average July temperature is above 90°. In much of the West, humidity conditions during the warmer portion of the year closely approach those obtaining in our artificially heated houses during cold weather.

The statistics presented by Prof. Huntington in this study are interesting, and, on their face, apparently verify, to some extent at least, the conclusions he draws therefrom; that is, that the number of deaths from pneumonia *on a given day* has a more or less direct relation to the temperature and humidity conditions prevailing *on that particular day*. It appears, however, that this method of applying the weather statistics to the mortality rate is open to serious question from more than one standpoint. This is particularly true with respect to the refinement with which he has grouped the days with certain outside temperatures for comparison with unknown conditions prevailing indoors. The same is true in the case of the relative humidity data. We shall show presently that, so far as the records at hand indicate, there is no dependable relation between outdoor temperature and relative humidity and that usually prevailing within

[2] If this holds good generally, there should be a marked contrast in the death rate between those sections of the country having humid climates and those characterized by the dryness of the atmosphere, the comparison being to the disadvantage of the drier climates, notwithstanding they are usually considered as healthful, or more so, than the more humid localities. For example, the average relative humidity at San Francisco for July, 1920, based on observations taken at 5 a. m., noon, and 5 p. m., local mean time, was 83 per cent, compared with an average at Denver of 41 per cent.—J. B. K.

our artificially heated houses, particularly in the colder weather.

Furthermore, the actual number of deaths from pneumonia, as well as from most other diseases, on a given day, must necessarily have a more or less definite relation to the prevalence of the disease and its virulence, and these obviously must depend on conditions, weather or otherwise, during several days preceding that on which death occurred, and could have no possible relation to weather conditions at the time of death. It goes without saying that if one does not contract pneumonia he will not die from it, and, in most cases of demise, the disease is contracted several days before death. Isn't here, then, the fountain head, or critical period, instead of the day when death occurs? Isn't the question of life or death in many cases decided for the individual prior to the day of demise?

It is the experience of many people that a sudden and marked change in temperature in winter, especially from cold to warm, results in what is commonly termed "a bad cold," which appears to be a distant relative of pneumonia. In the natural sequence of our winter weather a cold period is followed by a warm in about the average time required for pneumonia to reach the critical stage. If the disease were contracted during a sudden change from cold to warm, say, and death should occur during the following cold period, is it not possible that by Prof. Huntington's method we might erroneously charge the death to cold weather, and vice versa? We may cite, for example, the condition that prevailed in Washington on, and immediately succeeding, March 4, 1909, or at the time of the presidential inauguration of that year. Many persons, both Washingtonians and visitors, exposed themselves on the 4th to about as inclement weather as could be imagined; the result is a matter of history. In a week or 10 days thereafter an unusually large number of deaths from pneumonia occurred. The temperature averaged 32° on the 4th, and the streets ran full of slush composed of snow and water, with a high biting wind blowing at the rate of 25 to 30 miles an hour. Six days thereafter, however, or at about the time the large death rate began to occur, the temperature had risen to an average of 60°, and did not go below 40° until the 15th. We may ask, are those deaths properly chargeable to the weather prevailing on the day when death occurred or to the conditions on the 4th?

When statistics tell us that deaths from pneumonia are more frequent when the temperature is low, considering the year as a whole, it is equivalent to saying that they are more frequent in the winter season, but does this necessarily mean that low temperature is the cause? If so, we should have a progressive decrease in deaths from northern to southern limits of the country, with the greatest number in the north-central border States. On an average the temperature falls below 32° each winter on 182 days at Bismarck, N. Dak., on 110 days at Chicago, Ill., and on 95 days in New York City. On the other hand, freezing weather is experienced on the average on 5 days only in Jacksonville and New Orleans and on less than 1 day in San Francisco. As no such wide variations in the death rate have been shown to exist in these localities, may it not be that other features of weather, which have smaller geographic variations, play an important part in the matter? Temperature variability, or the change in the mean temperature from day to day, is usually about twice as great in winter as in summer; variations in barometric pressure have a similar seasonal range, and also the amount of sunshine; in New York the average number of hours of sunshine daily in January is 4.9 against 9.3 in July.

In discussing Table 2, Prof. Huntington says: "The harm that comes from a rise in temperature in any season except summer is not easy to explain. Apparently it arises largely from the fact that when the outside air grows warm the inside is apt to run up to high levels, even 75° or more, which is decidedly harmful." In this case we should expect to find the seasonal death rate reversed in northern and southern localities—Chicago and New Orleans, for example. The normal daily temperature is above 75° in New Orleans from the middle of May to the end of September, and does not go below 53° during the winter season. In Chicago, on the other hand, it does not reach 75° even in midsummer, but is below 40 from the middle of November to the end of March. The higher death rate in New Orleans, therefore, should come in the summer season.

Incidentally, Prof. Huntington speaks of a mild epidemic of pneumonia in New York as doubling the death rate for a couple of weeks the latter part of March, 1918, within the period covered by his investigations. An examination of the meteorological records for New York for that month discloses the fact that the month averaged 3.7° per day above the normal, and that only 3 days after the 16th had temperatures below normal, and they only slightly below. The last half of the month averaged 6.4° above the normal. While these temperatures, as March temperatures go in New York, should have favored a comparatively low death rate, as compared with this month in preceding years, he speaks of "a mild epidemic." However, with a further examination of the records for that month, an unusual condition appears as to temperature variability. On the 11th the mean daily temperature was 26° and on the following day it had risen to 40°; 32° was the average for the 15th, 48° for the 17th, and 56° for the 19th. In fact, for the month as a whole, only once in the preceding 20 years had the temperature been more variable in March. In contradiction to this, Table 2 shows a decline in death rate with large variability. May not this apparent discrepancy result from the method of considering the data for the day on which death occurred?

Is there a dependable relation between outdoor temperatures and relative humidity, and changes therein, to the indoor conditions in our artificially heated houses during the winter season? On this question hinges the practical application of the data Prof. Huntington presents in his paper, for those representing the meteorological side of the problem are all outside data. If there is no dependable relation, obviously the outside data tell us nothing, as the patients on the day of death were wholly under the influence of temperature and moisture conditions obtaining in the sick room.

No extensive simultaneous observations have been made in this country of temperature and humidity conditions indoors and out, although some data are available. Prof. Ward [3] made daily observations of this character from November 3 to November 23, 1899; 3 to 5 observations were taken daily. An examination of these data shows very little relation between the outdoor and indoor conditions. For example, we find for a given day an indoor relative humidity value of 32 per cent against an outside average of 60 per cent, and for another day an inside average of 31 per cent when the outside readings averaged 91 per cent. The range from minimum to maximum values was nearly three times as great outdoors as indoors. Moreover, on the days when the relative humidity inside was 30 to 32 per cent the outside averages were 60, 63, 64, 69, 70, 77, 90, and 91 per cent. Likewise in the case of temperature there was little comparability.

[3] See MONTHLY WEATHER REVIEW, Sept., 1908, 36:282.

On days with an indoor average of 67°, the outdoor averages ranged from 25° to 47°; with 68° indoors, the outdoor range was 24° to 39°; with 69°, 28° to 41°; and with 71°, 28° to 46°. It is further noted that the highest and the lowest mean daily outdoor values, 25° and 47°, occurred with an indoor mean of 67° on each day.

TABLE 3.—*Mean daily temperature and relative humidity indoors and outdoors at Topeka, Kans., November and December, 1909.*

Date.	Temperature.		Relative humidity.	
	Indoors.	Outdoors.	Indoors.	Outdoors.
Nov. 18	72	41	29	58
19	72	51	30	53
20	72	58	40	68
22	69	33	35	81
23	73	37	28	70
24	76	56	30	57
26	71	64	55	78
27	73	63	54	80
29	73	44	37	99
30	79	49	41	100
Dec. 1	75	50	39	81
2	71	43	34	75
3	70	41	37	91
4	71	24	26	94
13	76	25	22	87
14	76	27	23	75
15	75	25	20	76
16	74	34	23	74
17	71	10	20	63
18	74	12	17	75
20	72	15	20	73
21	72	19	19	74
22	71	17	20	92
23	75	24	19	87
27	75	25	23	73
28	77	21	18	81
29	74	4	15	72
30	74	30	19	68
31	76	34	22	78
Means	73	34	28	77

TABLE 4.—*Comparison of indoor and outdoor temperatures at Topeka, Kans., November and December, 1909.*

Indoors.	Outdoors.
64	32.
66	52, 58.
67	41.
68	7.
69	6, 14, 26, 38, 41.
70	11, 42, 43, 44.
71	11, 22, 27, 31, 38, 59.
72	23, 24, 26, 37, 43, 46, 47, 48, 52, 53, 54, 62, 64, 67.
73	5, 12, 16, 18, 18, 19, 22, 24, 26, 37, 37, 40, 45, 50, 61, 68.
74	−1, 13, 19, 26, 29, 31, 33, 36, 41, 49, 50, 65, 66.
75	6, 23, 29, 30, 39.
76	8, 20, 20, 25, 31, 32, 44, 52, 59, 65.
77	17, 17, 18, 25, 28.
78	17, 25, 41.
79	23.
80	32.
82	46.

NOTE.—This table shows the variations of outdoor temperatures with those observed indoors as shown in first column.

TABLE 5.—*Comparison of indoor and outdoor temperatures by grouping certain values of outdoor readings.*

Outdoor.	20° or less (22).	21–32° (25).	33–45° (19).	46–55° (12).	56–65° (8).	66–70° (3).
	°	°	°	°	°	°
Outdoor averages	13	27	40	50	62	67
Indoor averages	74	74	72	73	72	76

NOTE.—The groupings of outside temperatures in this table correspond to the divisions shown in Table 1 of Prof. Huntington's data. (Figures in parenthesis show number of observations.)

A somewhat more extensive series of observations was made by Mr. S. D. Flora,[4] in charge of the Kansas Climatological Service of the United States Weather Bureau at Topeka, Kans., in November and December, 1909. These are more representative of typical winter conditions as they were made mostly during a winter month and when outside temperatures were lower than those represented by Prof. Ward's data. Table 3 shows the results of Mr. Flora's observations reduced to daily values, and omitting several days on which only one observation was taken. The table in all cases, except December 31, represents the means of three observations, taken at 8 a. m., noon, and 8 p. m. An examination of these data shows that in this case, as in the other, there was practically no relation between the outdoor conditions and those prevailing indoors. In fact, an application of the "least square" statistical method of comparison to the temperatures shows a slight negative relation, with the probable error practically as large as the correlation coefficient. Table 4 shows the result of the individual observations in a comparative manner. It will be noted from this table that with an inside temperature of 73°, the outdoor readings ranged from 5° to 68°, and that 74° indoors compared with a range of −1° to 66° outside. In Table 5 we have grouped the outside temperature readings to correspond with the divisions given by Prof. Huntington in his Table 1. These comparisons speak for themselves and surely indicate that an attempt to carry a comparison of winter outdoor temperatures with unknown conditions inside, to the degree of refinement set forth in Table 1, is, to say the least, obviously questionable. What significance could a grouping of less than 20°, 20° to 32°, 33° to 45°, etc., have, when the temperature of the sick room (the only temperature condition that could affect the patient) probably was very infrequently below even 66°?

Some interesting comparisons may be made also between the indoor and outdoor relative humidity readings obtained in this series of observations. If we arrange the individual outdoor readings into groups, similar to those in Prof. Huntington's Table 6 (not here reproduced), namely, 0–55 per cent, 56–80 per cent, and 81–100 per cent, we find that 9 observations fell within the first group, 42 in the second, and 38 in the third. The means for the outside observations were 47, 71, and 92 per cent, respectively, but the corresponding inside values show no appreciable range, the averages for each of the first two groups being 27 per cent and for the other 30 per cent.

In this connection it may be of interest to note the result of some investigations that have been made on the effect of humidifying a school room on the intellectual progress of the pupils. (See *Science*, New York, June 2, 1917, **5**: 657–660.) In this experiment one group of pupils was domiciled during school hours in a room without humidification in which the relative humidity averaged about 28 per cent. The other group was kept in a room where the relative humidity averaged about 42 per cent. Mental tests were given each group at the beginning and at the end of the experimental period, which extended from December to March, inclusive, but these failed to show any difference in the work accomplished, although there was a slightly greater improvement in favor of the dry group. It may be noted also that a physical examination of the children at the beginning and at the end of the period showed similarly no apparent effect of the difference in the humidity conditions.

In considering the question of humidifying living rooms, it must be remembered that it is not feasible in cold weather to supply an amount of moisture suffi-

[4] See MONTHLY WEATHER REVIEW, May, 1917, 45: 231–233.

cient to raise the relative humidity to anything like that prevailing outdoors, owing to the annoying condensation on the windows or colder walls. In the experiments made at Topeka, Kans. (previously discussed) humidity observations were made also in living rooms in various parts of the city. It was found that when the indoor humidity was raised as high as 50 per cent in cold weather, the windows and even painted walls of the rooms were usually dripping with moisture. What would be the physical effect on passing from a room of this character into a piercing winter wind?

DISCUSSION BY AUTHOR.

Mr. Kincer's review brings up several points of much importance. For example, he points out that if the article in *Ecology* is correct, there "should be a marked contrast in the death rate between those sections of the country having humid climates and those characterized by dryness of the atmosphere, the comparison being to the disadvantage of the drier climates." This conclusion seems justified; it can not easily be tested, however, for many other factors, such as the degree of outdoor life, the relative ages of the population, the size of the cities, and the amount of manufacturing and other unhealthful occupations must be taken into account. Nevertheless, the statistics of three life insurance companies, which I have published in *Civilization and Climate*, page 184, show that when similar groups of "risks" are compared the death rate in the dry parts of the United States is decidedly higher than in the moister regions. Again, as I have shown in an article to be published shortly in the *Geographical Review*, the cities in dry regions—for example, Cairo, Mexico City, Madrid, and the cities of northern India—have much higher death rates than the corresponding cities in moister climates where the degree of progress is similar.

Another point raised by Mr. Kincer is the importance of the period preceding death and especially of the day when an illness is contracted. I agree with him entirely. He seems, however, to have overlooked the fact that I make comparisons between the death rate and the day when influenza was contracted in New York City. Furthermore, in a study of operations published in *The Modern Hospital*, Vol. XIV, No. 1,[1] I have shown that the climatic conditions, especially the humidity, on the day when operations are performed is much more important than on the day of death. I should have gone into the matter much more fully were it not that in the nature of things it is very difficult to determine just when a disease was contracted. The important point is that wherever it has been possible to examine the matter thoroughly, both the day of death and the day when a given ailment was contracted appear to show a close relationship to the weather. Presumably, the relationship is strongest on the most critical day of the disease, no matter when that may come. In this connection it may be noted that a study of millions of deaths described in *World Power and Evolution*, and in *Modern Medicine*, vol. 1, No. 1, shows that when the month is taken as a unit, the general relation between health and the climatic elements is the same as when the day is the unit. For example, except at high temperatures, the moister months regularly show a lower death rate than the drier months. This has nothing to do with the seasons, for it appears when a single month, such as January, is taken for a series of years.

[1] Reviewed in MONTHLY WEATHER REVIEW, May, 1920, 48: 279–280.

Still a third point is that if low temperature is the cause of deaths in winter, "we should have a progressive decrease in deaths from northern to southern limits of the country with the greatest number in the north central border States." This conclusion would be justified were it not that a study of some 9,000,000 deaths in France, Italy, and the United States shows that the human frame is much more sensitive in climates where there is little variation than in more rigorous climates. Hence the people in south Italy and New Orleans, for example, suffer severely in health under conditions of low temperature which would seem very mild and would do almost no harm to residents of the mountains of northern Italy or of Dakota.

In another place Mr. Kincer says that if a high temperature, such as an average of 75° within doors, is harmful, "we should expect to find the seasonal death rate reversed in northern and southern localities, Chicago and New Orleans, for example." That is, the highest death rate should come in Chicago in winter and in New Orleans in summer. This conclusion is not justified by the facts, for in both places the death rate from December to March is roughly 20 per cent greater than from June to September. Nor is it justified by anything that I have said. Whenever the average temperature departs far from 64° in either direction the death rate soon begins to show an upward tendency. People can do much to protect themselves, however, not only by regulating the temperature of dwellings, but by changing their mode of life, and by going out into the country and living out of doors in summer. In Chicago the great mass of ordinary people devote vastly more effort and expense to keeping warm in winter than to keeping cool in summer. In New Orleans the reverse is the case, in spite of the fact that the inhabitants are more sensitive to cold than are those of Chicago. Moreover, the Negroes who form so large a part of the population of New Orleans, not only are better adapted to hot weather than is the white man, but they flock cityward in winter, thus raising the death rate. In order to obtain a true comparison it is necessary to take cities of similar size, similar occupations, and as far as possible, of similar racial compositions. Moreover, the northern city should be far enough north to be largely free from the injurious effect of summer heat. No pair of cities satisfies these conditions, but a comparison of Minneapolis with Atlanta and Birmingham may be instructive. The following table shows the average number of deaths per day by months from 1913 to 1917. The northern city shows a maximum in January, while both of the others have theirs in June when the first heat of summer sweeps away a great many of the weaker parts of the community. This reversal between the north and the south agrees with the conclusions drawn from millions of deaths in a score of countries.

Deaths per day, 1913–1917.[2]

	Minneapolis.	Atlanta and Birmingham.		Minneapolis.	Atlanta and Birmingham.
January	*133.9*	151.3	July	104.4	171.8
February	126.0	173.5	August	98.9	154.0
March	128.2	173.3	September	102.7	146.7
April	125.0	158.2	October	102.9	143.6
May	120.7	171.3	November	109.7	157.8
June	101.4	*185.2*	December	123.0	162.0

[2] It is noted that July and August are the hottest months in Atlanta and Birmingham, both considerably warmer than June, yet in August the tabulation shows a death rate of 8 below the average for the year.—*J. B. K.*